2. DESERT TORTOISE HANDLING

The desert tortoise is a threatened species and protected by state and federal laws. Proper handling of the desert tortoise is required to comply with state and federal laws and to insure the safe and humane treatment of the tortoises. The desert tortoise is subject to several infectious diseases and proper handling includes attention to protocols to reduce the likelihood of infection or disease transmission. Tortoises are vulnerable to overheating and death if improperly exposed to direct sunlight and high ambient temperatures. Desert tortoise monitoring includes collecting data on the size (midline carapace length, mass) and sex of encountered tortoises. This handling can cause fluid loss if tortoises void their bladders. For these reasons, the U. S. Fish and Wildlife Service and the state wildlife agencies stipulate permit "Terms and conditions" that are the basis for the desert tortoise handling protocols for this project.

Objective 1: Compliance with state and federal desert tortoise handling protocols.

1. Each trainee will have a thorough understanding of and be able to describe the important elements of the U. S. Fish and Wildlife Service desert tortoise handling protocol (or permit terms and conditions).

2. Each trainee will have a thorough understanding of and be able to describe the important elements of the relevant state wildlife agency desert tortoise handling protocol(s) (or permit terms and conditions).

3. Each trainee when handling tortoises for measuring, weighing, marking, and sexing will fully comply in letter and spirit with every element of the U. S. Fish and Wildlife Service and the relevant state wildlife agency desert tortoise handling protocols (or permit terms and conditions). For example, strict adherence to temperature limitations is not enough; quick, efficient, shaded, 2-handed processing of desert tortoises during handling and data collection is imperative.

Standard: Avoid desert tortoise hyperthermia.
Standard: Avoid transmission of diseases between tortoises.
Standard: Avoid loss of fluids by tortoise.

Objective 2: Accurately weigh, measure, mark, and identify the sex of tortoises

Standard: Taking the mass of tortoises
Standard: Measuring tortoise length
Standard: Determining sex of a tortoise
Standard: Affixing tags to unmarked tortoises

Metrics: Trainees will demonstrate understanding of U. S. Fish and Wildlife Service and relevant state wildlife agency desert tortoise handling protocols (or permit terms and conditions). Trainees must be able to handle a tortoise without violating any of the U.S. Fish and Wildlife Service and relevant state wildlife agency desert tortoise handling protocols (or permit terms and conditions). Each trainee must properly handle and accurately measure length and mass and accurately determine sex of live tortoises (male, female, or subadult).

Key Facts

The Mojave population of the desert tortoise was listed as threatened under the Endangered Species Act in 1990. Potential threats to the desert tortoise include habitat loss, degradation, and fragmentation, illegal collecting, vehicle impacts, and excessive predation of hatchlings and juveniles by ravens and other species. It is also believed that an infection, Upper Respiratory Tract Disease (URTD), may play a role in population declines. Non-native annual plants and their effects on fire regimes have also been implicated.

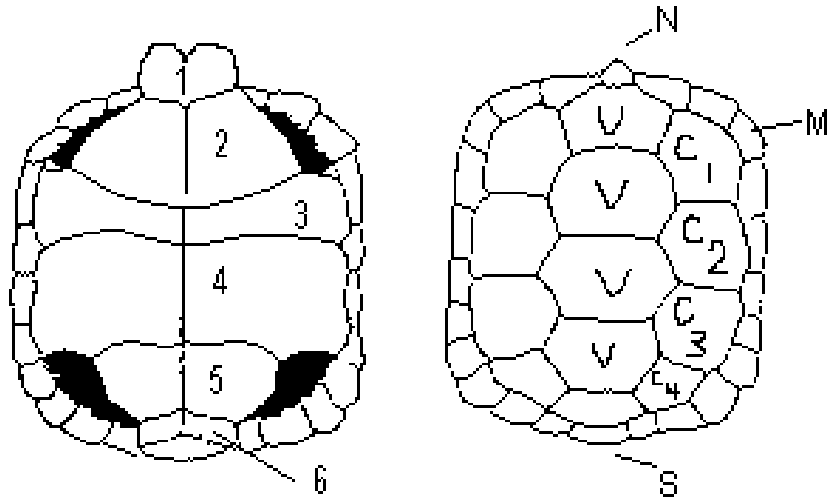
The desert tortoise is found only in the deserts of Arizona, California, Mexico, Nevada, and Utah. It is the largest reptile in the Mojave Desert, and serves as the state reptile for both California and Nevada. Most importantly, the desert tortoise is without question a flagship species, and possibly even a keystone and indicator species, so its persistence and recovery is both culturally and ecologically important.

Desert tortoises have a lifespan of 50 to 100 years. Adults can range be as large as 380mm long, and male tortoises tend to be larger than females. Males typically have a longer tail and longer upward curving gular horns than females, as well as larger chin glands and a concave plastron; females tend to have longer rear toe nails. Despite their long life spans and hardened exteriors, tortoises can be injured or die from improper handling. Anyone handling tortoises or conducting scientific research on them or their habitat must have appropriate state and federal permits.

Desert tortoises are herbivores that primarily feed upon annual grasses and flowering plants. They start to reproduce at 15 to 20 years of age, and females lay 1 to 6 eggs once or twice a year. Desert tortoises spend much of their time in underground burrows that protect them from extremes of the desert climate. When above ground, desert tortoises are found in habitats characterized by creosote bush, salt bush, cactus scrub, shadscale scrub, and Joshua tree woodlands, usually below 4200 feet in elevation. Historically, reported local densities have exceeded several dozen tortoises per square mile, however very few if any places support this many tortoises today. Tortoises display seasonal activity patterns; they are usually underground and inactive from mid-November through February, and they are active from March through late October, though less active during the hottest months.

A distinctive feature of tortoises is their shell. The dorsal (top) shell is the carapace and the ventral (bottom) shell is the plastron. Each section of the shell is called a scute (pronounced *scoot*). Individual scutes, or scute series, are identified by different names (Fig. 2-1). Although we will not use notching to mark tortoises, it is one form of marking you may encounter. These marks involve notching the marginals, which are identified as being on the tortoise's left or right, then counted up from 1, starting from the marginals immediately adjacent to the nuchal scute.

Figure 2-1. Tortoise Scute Identification. Individual scutes, or scute series, of the plastron (lower shell) and carapace (upper shell) of desert tortoises.



Plastron **Carapace**

1 – gular horn
2 – humeral
3 – pectoral
4 – abdominal
5 – femoral
6 – anal

C – Costal scute
V – Vertebral scute
M – Marginal scute
N – Nuchal scute
S – Supracaudal scute

Objective 1: Compliance with State and Federal Desert Tortoise Handling Protocols

You will be trained in proper handling techniques for desert tortoises so you can interact with them without harming them. Do not attempt to handle a desert tortoise until you have been trained to do so. Once you have been properly trained in tortoise handling, you will be covered under a USFWS permit, and other required permits, to handle tortoises during this project. You are responsible for following the protocols set forth by these permits. The brief description of proper tortoise handling procedures given here is to be considered only as a guideline.

The goal of desert tortoise handling training is to ensure the safety and well being of desert tortoises handled during monitoring activities. Safe practices include basic techniques that reduce stress and likelihood of disease transmission to tortoises while collecting distance sampling data. These techniques also reflect terms and conditions of U. S. Fish and Wildlife Service and relevant state wildlife agency tortoise permits.

Avoiding desert tortoise hyperthermia.
Tortoises have little effective physiological capacity to dissipate heat, so it is the handler's responsibility to guard against over-heating. Desert tortoises should not be exposed to direct

sunlight. Keep them in the shade of your body or a shrub. Remember that ground temperatures are much hotter than air temperatures, so minimize tortoise/ground contact when temperatures are hot. The critical maximum body temperature of desert tortoises is between 103^0 F and 112^0 F.

Avoiding transmission of diseases between tortoises.
At all times you must handle a tortoise as if it has a communicable disease. Before touching a tortoise you are required to put on a clean pair of non-porous disposable gloves (e.g. latex, vinyl, or similar material), and you must keep them on during the entire time you handle a tortoise. If your glove is torn during handling of a tortoise, replace it. Once used, gloves and any other disposable materials must be contained so as not to come into contact with sterilized materials, fresh gloves, equipment, or any other item that might come into contact with a tortoise. A fresh pair of gloves must be used for each tortoise. All equipment that comes into contact with any part of a tortoise, or any instrument or item that has been in contact with a tortoise, must be disinfected using an approved disinfectant. Currently, trifectant or chlorhexidine gluconate are approved for use, prepared according to manufacturers' instructions. Like 30% bleach, these are broad-spectrum disinfectants, but compared to bleach they are less corrosive and their disinfecting strength is less compromised by exposure to organic material. Once mixed, solutions may be used for up to one week. Do not allow tortoises to come into contact with your clothing or skin.

Avoiding loss of fluids by tortoises.
Special precautions should be taken to prevent or minimize the fluid loss that occurs if tortoises void their bladder during handling. Do not handle the tortoise more than necessary. For this project, the most important data (distance from the transect centerline) do not require handling of tortoises. It is important to minimize risk to tortoises when they are handled in the course of data collection. Always use two hands when picking up a tortoise, and do not turn it on its back or move it rapidly. Sudden movements can cause the tortoise to void (urinate), which can result in dehydration and increases risk of death. Refer to your permits for what to do should a tortoise void its bladder.

Tortoises that are found in burrows should only be extracted if they are accessible without reaching more than a foot into the burrow (for instance, if they are basking near the mouth). The goal is to avoid use of force by the human and to avoid struggle by the tortoise.

Objective 2: Accurately Weigh, Measure, Mark, and Identify the Sex of Tortoises

During this project you will collect information about tortoises detected on transects and encountered while on the way to and from transects. Related data will be collected for carcasses. See data sheets in Appendix II.

Taking the mass of tortoises
Because tortoise mass varies considerably depending on bladder volume, simple mass is not a useful indicator of overall condition. Starting in 2011, mass will not be taken as a routine part of monitoring. However, to develop experience handling tortoises before the field season, trainees will become comfortable weighing tortoises of different sizes. For this project, the preferred method for suspending tortoises from spring scales involves the use of a sling. Use a fresh piece of string, approximately 1 meter long. Tie the ends together to form a circle and place it on the ground. Lift the tortoise slightly off the ground and place it over the string circle evenly. Pick up

the string from the left and right sides of the tortoise and loop them around the hook of a spring scale. Lift the tortoise on the string just slightly off the ground and record the weight. Never suspend the tortoise far from the ground; suspend the tortoise over sand rather than rocks; keep weighing time to a minimum; and take every precaution to prevent the tortoise from falling. Keep your scales clean and free of dirt. When weighing a tortoise, hold the ring at the top of the scale to ensure that the scale is suspended vertically. Record to the greatest precision possible on your scale. Units should be milligrams.

Measuring tortoise length

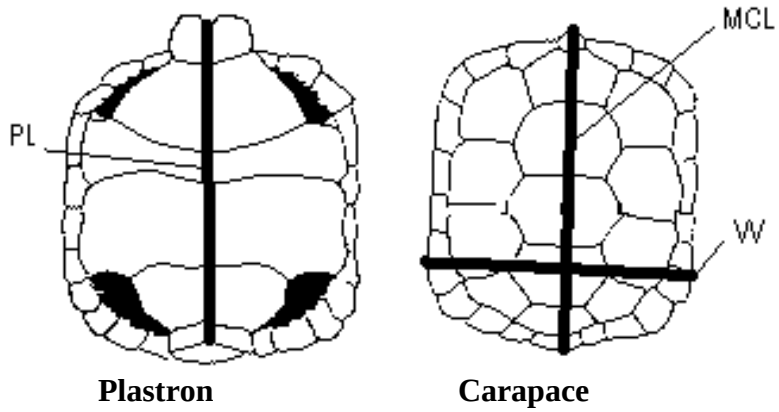
Of the measurements illustrated in Figure 2-2, you will measure only midline carapace length (MCL) in millimeters. Midline carapace length should be recorded on all accessible live tortoises. Using calipers, MCL is measured in millimeters from the most anterior scute (i.e. the nuchal; where the head emerges) in a straight line along the carapace to the most posterior scute (i.e. the supracaudal or pygal scute; where the tail emerges). There is no need to hold the tortoise to take this measurement unless it is trying to walk away. To take accurate measurements using calipers, make sure that the shaft is horizontal. Once the calipers are accurately placed, tighten the screw and then place the calipers next to a tape measure and record the MCL. Remember to wear gloves when handling tortoises and to clean equipment with disinfectant solution after each tortoise to prevent the spread of disease.

If a tortoise cannot be removed from a burrow, it is nonetheless important to record whether unhandled tortoises are adult ($\geq$ 180 mm MCL) or sub-adult. These size categories are used for density analysis, so every effort should be made to assess whether the tortoise is larger than 180mm.

Determining sex of a tortoise

Determining the sex of a tortoise with MCL <180 is generally difficult to do. Tortoises larger than this can usually be sexed using the following guidelines, with the most reliable characteristics listed first. The easiest way to identify males is to look for a concave plastron (females have no plastron concavity) so you can look under the tortoise while lifting it for weighing. Remember, never turn a tortoise onto its back. The second most obvious characteristic is that males have longer, more curved gulars than females. A third telling characteristic is their tail. Males have long, broad, conical shaped tails, while the female tail may be just a nub at the end of the cloaca. If you are still not sure of the sex, look for chin glands – males have large well-developed chin glands that sometimes leak fluid at this time of year. When in doubt, record sex as “unknown.”

Figure I. Typical measures of the dimensions of desert tortoises.



Plastron Length (PL): Length of the plastron (bottom shell) from gular notch to anal notch.

Midline Carapace Length (MCL): Length of carapace (top shell) along vertebral scutes from the nuchal to the rear marginal (supracaudal) scute.

Marking a tortoise

Paper tags will be affixed to a scute of each unmarked tortoise. Minimize the abrasion the tag will be subjected to; select a scute with a natural depression, considering first any of the costals, then the vertebrals (if the depression is quite deep- vertebrals endure a lot of scraping). Because tortoises are often relocated head-down in burrows, using the 4th right or left costal scute will increase the likelihood the tag will be read. When affixing the tag, under no circumstances should epoxy touch the margins of the scutes, where growth must occur. Subadult tortoises with scutes that are too small to safely affix tags should not be marked.

In addition to recording information for the new tag you attach, you will be asked about markings or tags that are already present on each tortoise. Floy© tags were used by range-wide monitoring crews in 2005 and 2007, and paper tags were used since 2008. Besides the use of tags, many researchers mark tortoises by notching the marginal scutes (see Fig. 2-1).

Carcasses

Record MCL and sex of carcasses only if you are able to determine these measures accurately. If the carcass/carapace is not sufficiently intact to measure MCL, it is "disarticulated." Other projects may have a different operational definition for this term. Note that in the past, carcasses were marked or the plastron was crushed to prevent re-recording in subsequent years. Since 2008, carcasses are not marked in any way.